

CHROMOSOME STUDIES IN THE SOUTHERN AFRICAN FLORA: 10-21

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10. HAWORTHIA ANGUSTIFOLIA Haw.

CHROMOSOME NUMBER: $2n = 14$ (Figs 1a, 1b).

ORIGIN OF MATERIAL: Hills E. of Grahamstown, C. G. Vosa 2074, living specimens at the Botany School, Oxford.

METHOD OF PREPARATION: Root-tip material, colchicine pretreatment, Feulgen (Acetic-orcein) staining.

OBSERVATIONS: This species and the eleven others in this contribution, have been collected in the wild by the authors and are preserved both as living specimens and as Herbarium material which is mostly kept at the National Botanic Gardens Herbarium at Kirstenbosch.

In all species the karyotype is strictly bimodal with eight large (L) chromosomes and six small (S) chromosomes.* Generally the short arm of at least three of the L-chromosomes and the long arm of all the S-chromosomes possess secondary constrictions of various width or terminally located reduced-staining segments. These secondary constriction gaps and these segments are allocyclic but generally do not form chromocentres in the interphase nuclei. Thus, they are not strictly heterochromatic in the accepted sense of the word but possess some of the attributes of heterochromatin and may prove to have great significance in the structure of the karyotype.

The nucleolar attachment is usually terminally located in the long arm of the L-chromosomes. It presents itself as a small satellite and is found mostly in a heterozygous condition in one or two or rarely three pairs of chromosomes. In the photographic illustrations the haploid karyotypes have been prepared with measurements taken by camera lucida on at least five metaphases in three or more clones.

*(see Brandham (1971) for discussion)

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FIG. 1A
Mitotic metaphase in *H. angustifolia* Haw.

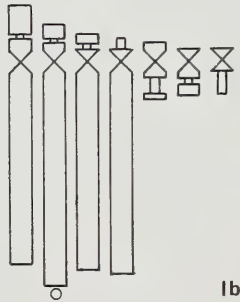


FIG. 1B
Diagrammatic representation of the haploid karyotype of *H. angustifolia* Haw.

11. *HAWORTHIA ARACHNOIDEA* (L.) DuvalCHROMOSOME NUMBER: $2n = 14$ (Figs 2a, b).ORIGIN OF MATERIAL: Bavians, W. Laingsburg, *M. B. Bayer 2105* (NBG); *C. G. Vosa 2269*.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: In this species the S1-chromosomes possess a rather long "euchromatic" segment in their long arm. These chromosomes could be used as a convenient marker (Fig. 2a, arrows).

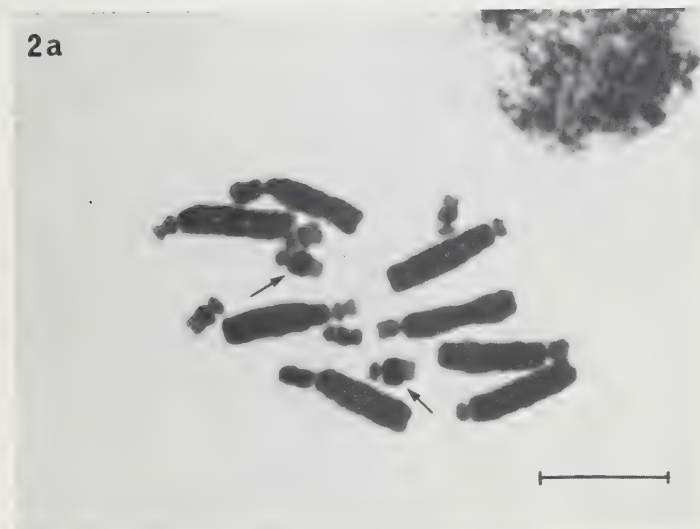


FIG. 2A

Mitotic metaphase in *H. arachnoidea* (L.) Duval. The arrows indicate the two S1-chromosomes with a long "euchromatic" segment in the long arm.

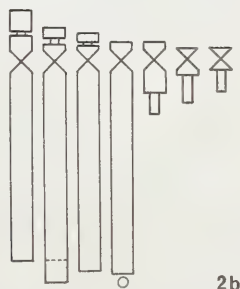


FIG. 2B

Diagrammatic representation of the haploid karyotype of *H. arachnoidea* (L.) Duval.

12. *HAWORTHIA BAYLISSII* ScottCHROMOSOME NUMBER: $2n = 14$ (Figs 3a, b).ORIGIN OF MATERIAL: Oude Kraal, S. Somerset East, *M. B. Bayer 2052*; *C. G. Vosa 2235*.

METHOD OF PREPARATION: As in 10.

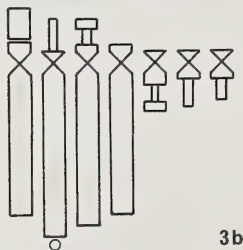
OBSERVATIONS: Although morphologically very similar to *H. angustifolia* Harv. the chromosomes of this species show some differences particularly in the size of the allocyclic segments in L2 and L3-chromosomes and in all S-chromosomes.

This collection from the type locality does not correspond with the description for *H. baylissi* and it is supposed that the species was based on an aberrant plant. This is supported by co-types collected by L. D. A. Bayliss in the original collection and grown at Kirstenbosch, which also resembled *H. angustifolia* in most respects. Chromosomal differences observed here are therefore surprising.

3a



FIG. 3A
Mitotic metaphase in *H. baylissii* Scott.



3b

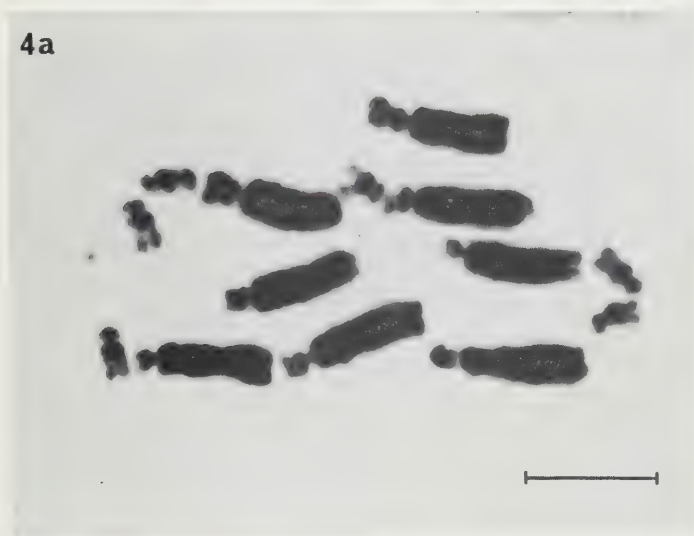
FIG. 3B
Diagrammatic representation of the haploid karyotype of *H. baylissii* Scott.

13. *HAWORTHIA BLACKBURNIAE* BarkerCHROMOSOME NUMBER: $2n = 14$ (Figs 4a, b).

ORIGIN OF THE MATERIAL: Ladismith, C. G. Vosa 2035.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: The S-chromosomes possess relatively long, distally located allocyclic segments.



Mitotic metaphase in *H. blackburniae* Barker. Note the long allocyclic segments in the long arms of the S-chromosomes.

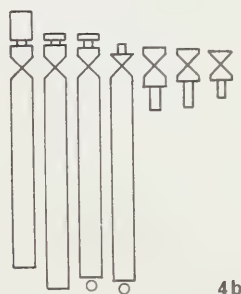


FIG. 4b

Diagrammatic representation of the haploid karyotype of *H. blackburniae* Barker.

14. **HAWORTHIA BOLUSII** Bak.CHROMOSOME NUMBER: $2n = 14$ (Figs 5a, b).ORIGIN OF MATERIAL: Graaff Reinet, *M. B. Bayer* 2022; *C. G. Vosa* 2230.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: Some details of chromosome morphology are very interesting, especially in relation to the S-chromosomes which provide a good marker for separating this species from *H. arachnoidea* (L.) Duval.

FIG. 5A
Mitotic metaphase in *H. bolusii* Bak.

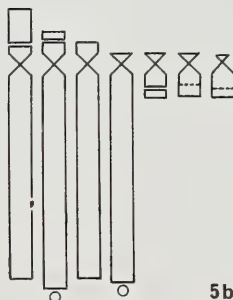


FIG. 5B
Diagrammatic representation of the haploid karyotype of *H. bolusii* Bak.

15. *HAWORTHIA COOPERII* Bak.CHROMOSOME NUMBER: $2n = 14$ (Figs 6a, b).

ORIGIN OF MATERIAL: Keiskammahoek, C. G. Vosa 2271.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: The chromosome morphology of this species resembles that of *H. nortieri* Smith (q.v.), but the S-chromosomes have a distally located non-allocyclic segment.

6a

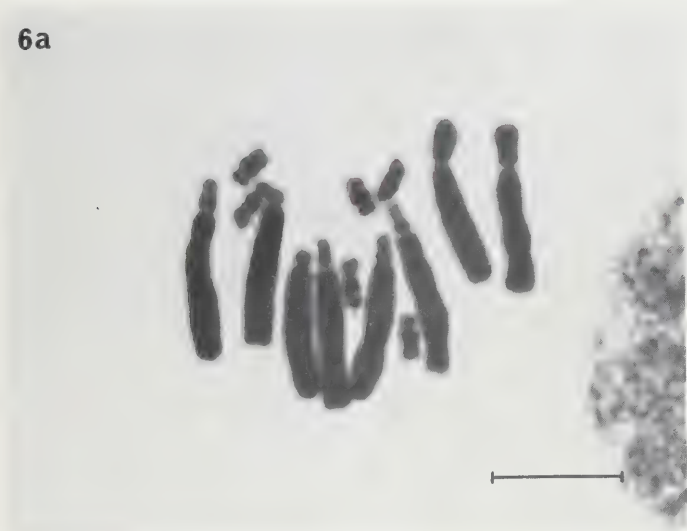
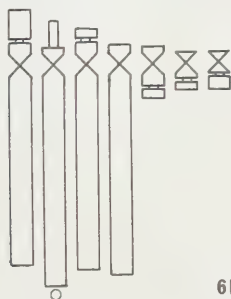


FIG. 6A

Mitotic metaphase in *H. cooperii* Bak.

6b

FIG. 6B

Diagrammatic representation of the haploid karyotype of *H. cooperii* Bak.

16. *HAWORTHIA HERBACEA* (Mill.) StearnCHROMOSOME NUMBER: $2n = 14$ (Figs 7a, b).

ORIGIN OF MATERIAL: Hammonshof Pass, C. G. Vosa 1974.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: The overall chromosome morphology of this species is within the normal variation found in the genus, however, the L4-chromosome has a very distinct constriction in the distal part of the long arm (Fig. 7a, arrows).

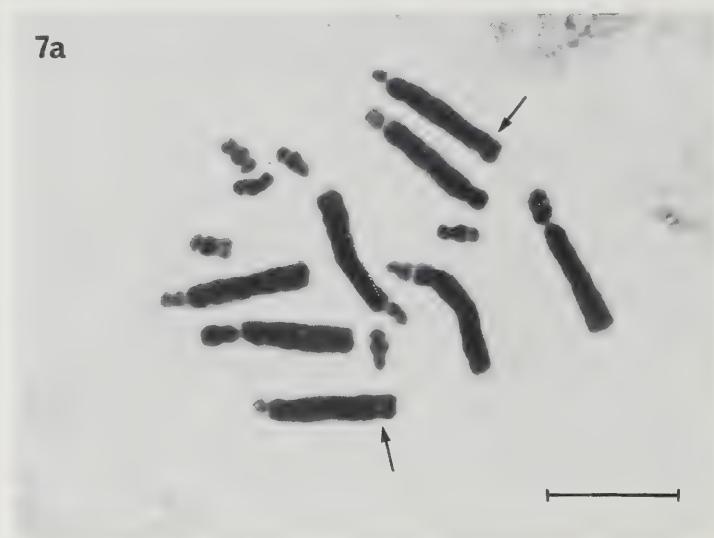


FIG. 7A

Mitotic metaphase in *H. herbacea* (Mill.) Stearn. Note the secondary constriction in the distal part of the long arm of the L4-chromosomes (arrows).

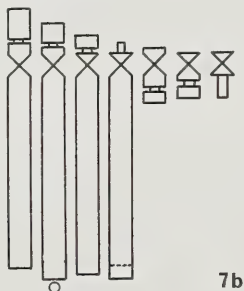


FIG. 7B

Diagrammatic representation of the haploid karyotype of *H. herbacea* (Mill.) Stearn

17. **HAWORTHIA NORTIERI** var. **NORTIERI** SmithCHROMOSOME NUMBER: $2n = 14$ (Figs 8a, b).

ORIGIN OF MATERIAL: Matsikamma Mts., Vanrhynsdorp, M. B. Bayer 1972; C. G. Vosa 2236.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: The overall chromosome morphology is very similar to *H. semi-viva* (v.Poelln.) Bayer (q.v.), but the L1-chromosome has only one secondary constriction in its short arm.

8a

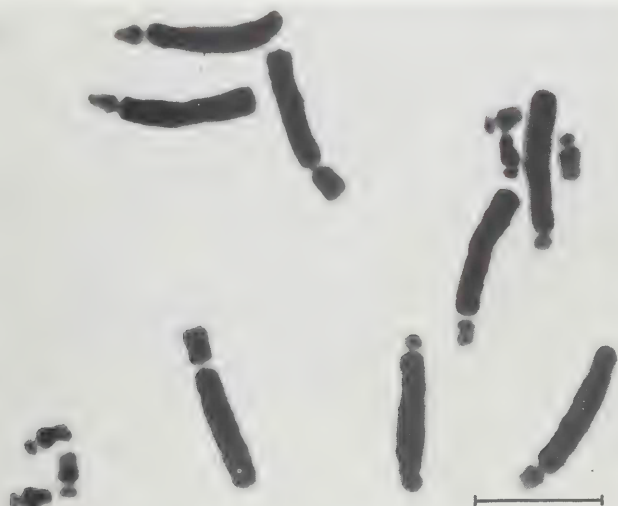
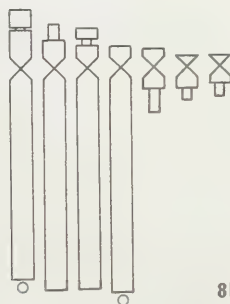


FIG. 8A

Mitotic metaphase in *H. nortieri* var. *nortieri* Smith.

8b

FIG. 8B

Diagrammatic representation of the haploid karyotype of *H. nortieri* var. *nortieri* Smith.

18. *HAWORTHIA SEMIVIVA* (v. Poelln.) BayerCHROMOSOME NUMBER: $2n = 14$ (Figs 9a, b).ORIGIN OF MATERIAL: Williston, *M. B. Bayer 1274*; *C. G. Vosa 2258*.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: The short arm of the L1-chromosome has two distinct secondary constrictions (Fig. 9a, arrows).

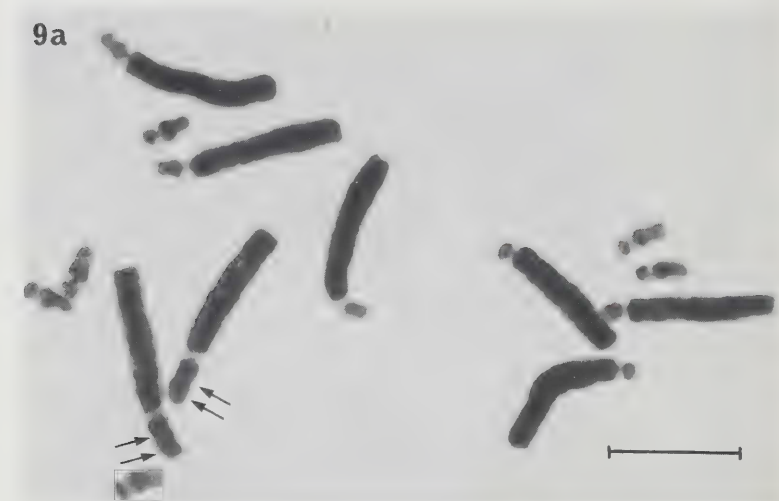


FIG. 9A

Mitotic metaphase in *H. semiviva* (v. Poelln.) Bayer. Note the two secondary constrictions in the short arm of the L1-chromosomes (arrows).

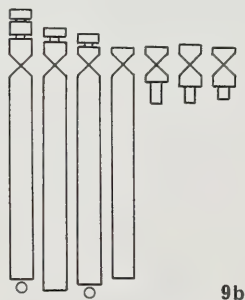


FIG. 9B

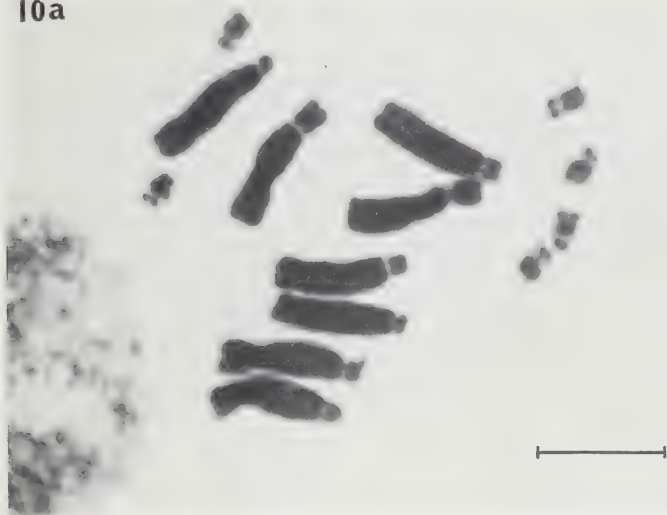
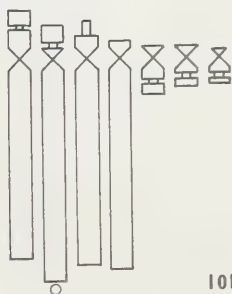
Diagrammatic representation of the haploid karyotype of *H. semiviva* (v. Poelln.) Bayer.

19. *HAWORTHIA TRANSLUCENS* Haw.CHROMOSOME NUMBER: $2n = 14$ (Figs 10a, b).ORIGIN OF MATERIAL: Hellspoort (Grahamstown), *C. G. Vosa* 2136.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: Chromosome morphology very similar to *H. cooperii* Bak. (q.v.), but with a relatively shorter short arm in the L1-chromosome.

10a

FIG. 10A
Mitotic metaphase in *H. translucens* Haw.

10b

FIG. 10B
Diagrammatic representation of the haploid karyotype of *H. translucens* Haw.

20. *HAWORTHIA TRUNCATA* Schonland

CHROMOSOME NUMBER: $2n = 14$ (Figs 11a, b).

ORIGIN OF MATERIAL: var. *tenuis*. De Rust, M. B. Bayer s.n.; C. G. Vosa 2252; var. *truncata*. Oudtshoorn, M. B. Bayer s.n.; C. G. Vosa 2251.

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: The illustrations refer to the var. *tenuis*. The two varieties of this species are indistinguishable chromosomally. In cultivation at the Karoo Botanic Garden, the variety *tenuis* has been observed to lose its characteristic small form and varietal status is dubious on that score too.

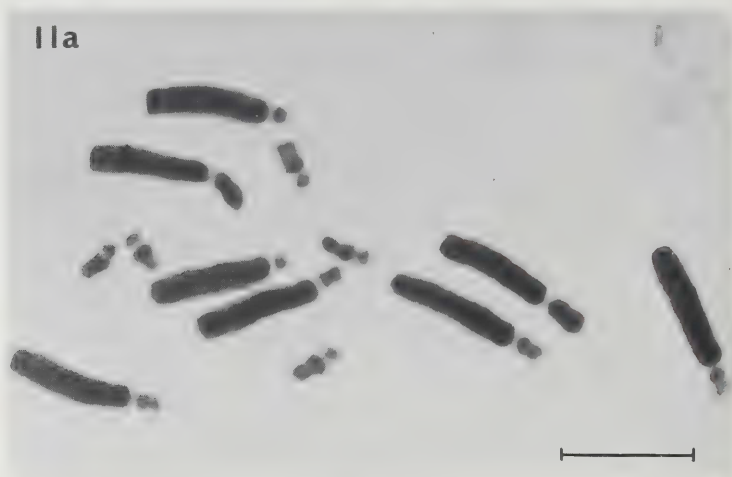


FIG. 11A
Mitotic metaphase in *H. truncata* var. *tenuis* Schonland.

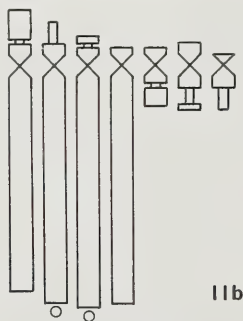


FIG. 11B
Diagrammatic representation of the haploid karyotype of *H. truncata* var. *tenuis* Schonland.

21. **HAWORTHIA UNICOLOR** var. **VENTERI** (v.Poelln.) BayerCHROMOSOME NUMBER: $2n = 14$ (Figs 12a, b).ORIGIN OF MATERIAL: 4 km west of Vanwyksdorp, *M. B. Bayer s.n.* (KG 555/71)

METHOD OF PREPARATION: As in 10.

OBSERVATIONS: The chromosome morphology of this species is interesting. The usual secondary constriction is absent from the short arm of the L1-chromosome but a very prominent one is located in the distal part of its long arm (Fig. 12a, arrows).

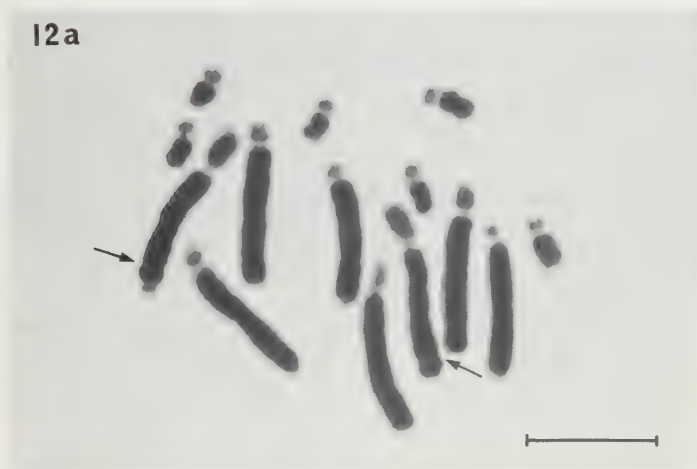
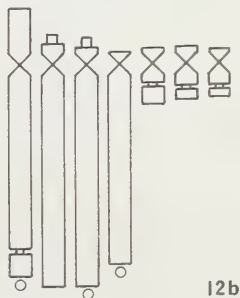


FIG. 12A

Mitotic metaphase in *H. unicolor* var. *venteri* (v. Poelln.) Bayer. Note the prominent secondary constrictions in the long arm of the L1-chromosomes (arrows) and the absence of the secondary constriction in the short arm of the same chromosomes.



12b

FIG. 12B

Diagrammatic representation of the haploid karyotype of *H. unicolor* var. *venteri* (v.Poelln.) Bayer.

REFERENCES

- BRANDHAM, P. E., 1971. Polyploidy and karyotype variation in the Aloineae. *Kew Bull.* **25**: 381-399.
- RILEY, H. P., 1960. Chromosome numbers in the genus *Haworthia*. *Jl S. Afr. Bot.* **26**: 139-148.